

## **RIMPAC-08 Planning and Support and OAML Certification**

Dr. Thomas E. Giddings

Metron, Inc. 1818 Library St., Suite 600 Reston, VA 20190

phone: (703) 326-2828 fax: (703) 787-3518 email: [giddings@metsci.com](mailto:giddings@metsci.com)

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<http://www.metsci.com>

### **LONG-TERM GOALS**

Electro-optical identification (EOID) systems are playing an increasingly important role in mine countermeasures (MCM) operations. EOID systems, and other MCM assets, can be used more effectively when tactics and mission planning account for the state of the battlespace environment. The long-term goal of several ONR programs in the Ocean, Atmosphere & Space Division is to develop and transition systems and software to survey the battlespace environment and provide performance estimates for EOID systems operating in that environment. The environmental characterizations and EOID performance predictions are provided to MCM commanders and mission planners anywhere around the world in near real-time to aid in asset allocation and the development of an appropriate and effective course of action. Performance prediction software will be certified for inclusion in the Oceanographic and Atmospheric Master Library (OAML) and placed under configuration management.

### **OBJECTIVES**

The objectives of this project were to demonstrate a complete tactical performance prediction capability for electro-optical identification (EOID) systems during the RIMPAC-08 Naval exercise and to prepare EODES performance prediction code for submission to the Oceanographic and Atmospheric Master Library (OAML) Software Review Board (SRB) for certification as a Navy standard model. The RIMPAC-08 exercise is described in last year's annual report for this same contract, so we will limit the present review to the submission of EODES software to the OAML SRB.

### **APPROACH**

The preparation of EODES performance prediction software for OAML submission consisted of:

- Assembling a complete set of documentation including: a software requirements specification (SRS), a software design document (SDD), and a software test description (STD).
- Developing a battery of verification tests to ensure proper performance on different computer platforms (i.e., UNIX/LINUX and Windows).
- Preparing a Preliminary Engineering Change Proposal (PECP).

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- Providing two separate presentations to the OAML Software Review Board (SRB) describing the technical foundation of the EODES models (24 Sept. 2007) and the package submitted for potential certification (25 June 2008).

For a complete description of the RIMPAC-08 demonstration please refer to the FY08 ONR annual report for this contract.

## **WORK COMPLETED**

This effort was largely completed in FY08 and extended only a few months into FY09. Work during FY09 was limited to a Hot Wash review of the RIMPAC-08 demonstration at the Naval Oceanographic Office (NAVOCEANO) on 22 January 2009, and the submission of EODES performance prediction software to the review board of the Oceanographic and Atmospheric Master Library (OAML). Initial submission of EODES software was in August 2008 and several incremental changes were made over the Spring of 2009. The EODES submission is currently undergoing review, which should be completed in October 2009. For a thorough review of the RIMPAC-08 demonstration please refer to the FY08 ONR annual report for this project.

## **RESULTS**

An OAML CIMREP (CNMOC Independent Model Review Panel) was formed to evaluate the EODES software package. The CIMREP consists of Dr. Kevin L. Mahoney (NAVOCEANO) and Dr. Alan Weidemann (NRL-Stennis). The review is nearing completion and a report is scheduled to be presented at the October 2009 meeting of the OAML Software Review Board (SRB).

## **IMPACT/APPLICATIONS**

EODES performance prediction tools are being incorporated in a near real-time tactical decision aid by the Naval Oceanographic Office (NAVOCEANO). The oceanographic and performance products will help MCM commanders and mission planners make more effective use of available assets and develop more effective tactics to accomplish mission objectives. This capability was successfully demonstrated at the RIMPAC-08 exercise.

## **TRANSITIONS**

EODES performance prediction software is expected to be the first electro-optics model included in the Oceanographic and Atmospheric Master Library (OAML) and is scheduled to be transitioned to NAVOCEANO upon completion of the OAML certification process. EODES software is also being used to evaluated airborne LIDAR performance for NAVSEA and next-generation underwater EOID systems for ONR.

## **RELATED PROJECTS**

The EODES models were developed under the ONR project entitled “A Comprehensive Model for Performance Prediction of Electro-Optical Systems” (contract number N00014-06-C-0070). This work is being continued under the ONR project entitled “Electro-Optical System Simulation and Performance Prediction Extensions to EODES” (contract number N00014-09-C-0273). The goal of

these projects is to develop high-fidelity, validated models for electro-optical imaging systems. The models provide performance estimates for EOID systems based on in-situ measurements of optical properties in the operational areas. These are being used as near real-time tactical decision aids for MCM commanders and mission planners. The electro-optical models are also capable of providing realistic simulations for a variety of imaging systems to support system design and evaluation, to assist in operator training, and to inform investment/procurement decisions.

## REFERENCES

- [1] T. E. Giddings and J. J. Shirron, "Numerical simulation of the incoherent electro-optical imaging process in plane-stratified media," *J. Opt. Engrg.*, under review, 2009.
- [2] T. E. Giddings, J. J. Shirron, and A. Tirat-Gefen, "EODES-3: An electro-optic imaging and performance prediction model," *MTS/IEEE Oceans '05 Conf. Proc.*, vol. 2, pp. 1380-1387, (Washington, DC) 19-23 Sept., 2005.
- [3] T. E. Giddings and J. J. Shirron, "Performance prediction for electro-optical mine identification systems," *8<sup>th</sup> Intl. Symp. on Technology and the Mine Problem*, MINWARA, (Monterey, CA) 6-8 May, 2008.
- [4] T. E. Giddings and J. J. Shirron, "Performance prediction for underwater electro-optical mine identification systems," *Ocean Optics XIX Conf. Proc.*, (Tuscany, Italy) 6-10 Oct., 2008.
- [5] J. J. Shirron and T. E. Giddings, A model for the simulation of a pulsed laser line scan system," *MTS/IEEE Oceans '06 Conf. Proc.*, (Boston, MA) 18-21 Sept., 2006.
- [6] F. R. Dagleish, P. R. Bordner, and F. M. Caimi, "HBOI extended range optical imaging test facility," in *Ocean Optics XVIII Conf. Proc.*, (Montreal, Canada) 9-13 Oct., 2006.
- [7] F. Dagleish, F. Caimi, Y. Wan, W. Britton, J. J. Shirron, T. E. Giddings, C. H. Mazel, J. M. Glynn, and J. P. Towle, "Experimental validation of a laser pulse time-history model," in *Ocean Optics XIX Conf. Proc.*, (Tuscany, Italy) 6-10 Oct., 2008.
- [8] F. R. Dagleish, F. M. Caimi, W. B. Britton, T. E. Giddings, J. J. Shirron, and C. H. Mazel, "Experimental validation of an underwater electro-optical image prediction tool," in preparation.

## PUBLICATIONS

- [9] K. L. Mahoney, K. Grembowicz, B. Bricker, S. Crossland, D. Bryant, M. Torres, and T. Giddings, "RIMPAC 08: Naval Oceanographic Office Glider Operations," *SPIE Defense, Security, and Sensing*, (Orlando, FL) 13-17 April, 2009.
- [10] S. Ladner, R. Arnone, B. Casey, A. Weidemann, D. Gray, I. Shulmann, K. Mahoney, T. Giddings, and J. Shirron, "Defining the uncertainty of electro-optical identification performance estimates using a 3-dimensional optical environment derived from satellite data," *SPIE Defense, Security, and Sensing*, (Orlando, FL) 13-17 April, 2009.